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high hydrogen ion concentration is reached, and furthermore, that these four organisms respond in about the same way, though there are distinct variations among them. Furthermore, as might be expected, the curves obtained are similar to those showing the relation between enzyme activity and hydrogen ion concentration.

The most important facts to be presented here can be shown by means of a general curve setting forth the general behavior of the four fungi studied. The curve shown in the accompanying figure is constructed by plotting as ordinates the weights in grams of mycelium, produced in about five weeks' time upon media of varying  $P_H$  values as represented by the abscissae. This curve shows in a very general way the mean of the individual curves for the different fungi when grown upon the two media. The weight of mycelium produced shows large variation among the individual curves while there is rather close agreement in the  $P_H$  values which are physiologically important to the various fungi.

In the following discussion we shall speak of the "first critical point," meaning the  $P_H$  at *B* (figure), the point where the first marked deflection in the growth curve appears; the "second critical point," meaning the  $P_H$  at *C*, where the second marked deflection in the growth curve occurs in the opposite sense; and the "limiting acidity," meaning the  $P_H$  at *D*, where practically no growth occurs. By "critical range" we shall mean the range of the  $P_H$  values included between the first and the second critical points.

The curve in the accompanying figure is drawn with the portion *AB* horizontal. In the individual curves—that is for a single fungus on a single medium—this part may be horizontal or may slope either up or down in passing toward *B*. Or again, in passing from *A* toward *B* the curve may rise to a maximum and then fall toward the critical point *B* where a sharp inflection downward occurs. Such a maximum, when present, usually occurs nearer *B* than *A*—that is, at a  $P_H$  of about 3.0. The critical points stand out more sharply in some than in other curves and the first critical

point is usually more pronounced than the second critical point. The slope between *B* and *C* shows a rather large variation in the

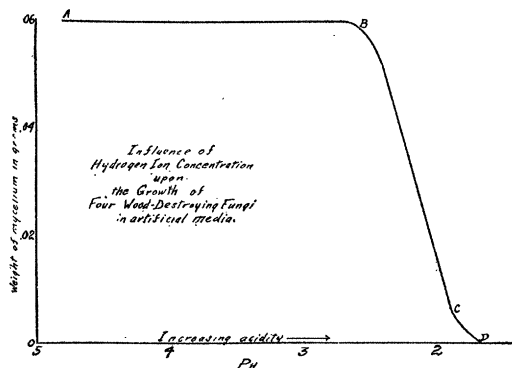


FIG. 1.

individual curves. In some cases the line between these two points is nearly vertical. In this curve the point *D* appears as a rather abrupt point. Point *C* often occurs nearer the lower axis and the portion of the curve *CD* occurs more nearly horizontal with a more or less uncertain termination. However, the limiting  $P_H$  value appears to be in the region of 1.7.

Translating these data into terms of normality, the first critical point occurs at about 1/350 normal, and the limiting acidity at about 1/50 normal, hydrogen ion concentration.

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